QUESTIONS AND ANSWERS

PLEASE REFER TO THE GENERAL FAQS SECTION OF ARPA-E'S WEBSITE (HTTP://ARPA-E.ENERGY.GOV/?Q=FAQ/GENERAL-QUESTIONS) FOR ANSWERS TO MANY GENERAL QUESTIONS ABOUT ARPA-E AND ARPA-E'S FUNDING OPPORTUNITY ANNOUNCEMENTS. ADDITIONAL QUESTIONS SPECIFIC TO THIS FOA ONLY ARE INCLUDED BELOW. PLEASE REVIEW ALL EXISTING GENERAL FAQS AND FOA-SPECIFIC QUESTIONS BEFORE SUBMITTING NEW QUESTIONS TO ARPA-E.

I. Concept Paper Phase Questions:

Q1. I have a question for Category D. When we propose the testing and validation cases, shall we consider both residential and commercial cases? In other words, the testing and validation should be conducted in:

1. **Residential Buildings: a) older homes built in the 1904;b) house stock from 1970-80s;c) a modern very open-plan home.**
2. **Commercial Buildings: a) an open office with conference rooms; b) a closed individual office with conference rooms; c) an auditorium mixed offices in academic building.**

In total, we should test 6 cases? Or shall we just focus on either residential or commercial buildings?

ANSWER: Proposed Category D testing and validation cases may either address both residential and commercial cases, or residential cases or commercial cases only.

Q2. I would like to submit an application for funding with a collaborator from [omitted]. My question is whether I can be PI or co-PI on the project. At this moment I don't have US citizenship or US permanent residentship.

ANSWER: Principal Investigators and other researchers are not necessarily required to be U.S. citizens or permanent residents. Hiring/work assignment decisions for ARPA-E research should consider that ARPA-E awards normally involve technology or software - including any manufacturing know-how - that is "restricted or proprietary" as cited in export control regulations (at 15 C.F.R Section 734.8(a)). This includes when a university awardee partners with/licenses to a for-profit team entity, or if the university awardee seeks ARPA-E approval of "protected data" resulting from the research. Also, awardees' inventions resulting from ARPA-E research must be reported and protected, and are subject to U.S. manufacturing requirements. Refer to Attachment 1, Clauses 3 and 11, and Attachment 2 of your ARPA-E Cooperative Agreement for awardee immigration and export control obligations.

QUESTIONS AND ANSWERS

Q3. I have a few questions:

1) Category B: FOA page 16 Table 3 " Ensure a varied number of skin colors, body types, and physical ability levels (i.e. use of wheelchairs and the like) are adequately represented in both simulation and laboratory-scale testing scenarios ."

For the testing, sensor should be tested for the detection of number of people regardless of skin colors, body type, etc. But for the building energy simulation, as long as number of people is given, the saving potential for occupancy based control can be evaluated. My question: how can the simulation be used to ensure adoption diversity?

2) Category B and D: What is the definition of the baseline (e.g., HVAC control strategy) for achieve >30% energy savings in the simulation case for commercial buildings? Should the proposer come up the baseline?

3) Category D: For the demonstrated savings in lab testing and field testing, what is the required baseline for commercial buildings? Should the current HVAC system in the buildings be used? Or it has to be a system without any occupancy based control. In reality, some buildings may have some limited occupancy based controls, say temperature setback based on occupant presence only.

ANSWER:

1. Diversity must be accounted for in simulations and any planned experimentation such that the system is proven insusceptible to false negative readings during real-world deployment.

2. Yes it is encouraged the proposer come up with their own baseline case. However it is not required, that Concept Papers provide detailed simulations that justify the feasibility of the proposed technical approach to achieve the energy savings and failure rate metrics. This more detailed analysis will be required in Full Application submissions, please see Section IV of the FOA. A very simple methodology is also shown in Section I.G of the FOA.

3. Yes, it is acceptable to use a steady state building baseline of the applicant's choosing that does already utilize operational setbacks. The accuracy and level to which an applicant's baseline simulation reflects reality will be assessed during submission review. Note that at the Full Application stage, multiple buildings and scenarios will be required.

QUESTIONS AND ANSWERS

Q4.

Reading the (FOA), it seems that we have to submit only one concept paper even if we are targeting more than categories from A,B, and C.
However, I have a complete different approach (and potentially different research team) dealing with each one of these categories. In that case, am I allowed to have more than one concept paper?

ANSWER: See DE-FOA-0001737, Section III.C.4 (Limitation on Number of Submissions).

Q5. We are working on putting together a concept paper with an occupancy sensor company partner. We plan to address Category B and the project will include some product development, integration to a building controls system, testing in the lab, and testing in the field. Can a project proposal for Category B include field testing?

ANSWER: ARPA-E encourages validation testing for all occupancy sensing systems.; If the level of testing doesn't merit a full Part D Concept Paper, the testing is welcome as an addition to parts A, B, or C.

Q6. Will indirect methods (inference based) for accurately determining human presence inside a building be suitable? Or should the human presence be directly sensed?

ANSWER: See General FAQ 2.7, found at https://arpa-e.energy.gov/?q=faq/general-questions.

Q7. Is DOE looking for proposals that develop new hardware technologies as sensors in this funding opportunity?

ANSWER: See General FAQ 2.7, found at https://arpa-e.energy.gov/?q=faq/general-questions.

QUESTIONS AND ANSWERS

Q8. Can one select to address through concept papers one or more items from the A A,B,C or D items to respond to? or gards;we have to respond to all four items simultaneously?

ANSWER: Refer to the Required Documents Checklist on p.1 of the FOA: Applicants may submit Concept Papers addressing Category A, B, C or any combination thereof. Applicants may also submit Concept Papers solely to Category D. Concept Papers submitted to Category D must be devoted solely for Category D. ARPA-E is not limiting the number of Applications that may be submitted by Applicants, provided that each Application is scientifically distinct. Thus, Applicants may submit a Concept Paper for Category A and/or B and/or C, plus a separate Concept Paper for Category D. However, a Concept Paper submitted to Category D may not identify any other technical Category, or else it will be found to be noncompliant.

Q9. We were wondering if you are available for a quick chat to discuss our research concept?

ANSWER: See General FAQs 2.3 and 2.6, found at https://arpa-e.energy.gov/?q=faq/general-questions.

Q10. Will institutions be required to use the DOE IRB protocol for Human Subjects for testing under this FOA?

ANSWER: Research supported by DOE requires compliance with all pertinent Federal regulations, see https://science.energy.gov/ber/human-subjects/ for details. Consult with your institutional representatives regarding specific application to the proposed work.

QUESTIONS AND ANSWERS

Q11. Please clarify if Category D is desired to include Category C sensors for both lab and field testing - it is stated as such on pg 4: "D. Real-World testing and validation of A, B, and C in both laboratory controlled quasi-real world environments and actual field deployment tests throughout the program timeframe." However, it is left out of the description on page 7: "Testing and validation research must deliver a clear means for assessing the energy saving impact of both the residential and commercial (Categories A and B) technologies in a wide variety of floorplans." It is also left out, potentially, of the description on page 9: "Teams submitting in Category D only will develop simulation tools and real-world field testing protocols for human presence or people counting technologies in general."

ANSWER: Yes, as stated in Section I.D of the FOA on p.12 (Category D: Testing and Validation for Both Residential and Commercial Validation): Laboratory controlled, quasi-real world environments, and actual field deployment tests for technologies from Categories A, B, C, and others in the market throughout the program timeframe."

Q12. For proposers under Cat D, should it be assumed that all proposals submitted under Cat A or B sensors will need to be tested? Or is a subset acceptable? Can Cat D proposals include testing of occupancy sensor technologies that did not apply under Cat A or B but otherwise provide the functionalities described for A and B?

ANSWER: See ARPA-E's response to Q11 above.

Q13. The Template includes a Proposed Work section with the "final deliverable and overall technical approach used to reach project objectives". Is a formal work plan (Gantt chart) required in this section?

ANSWER: No.

Q14. Are there limitations on the project duration (minimum or maximum)?

ANSWER: As stated in Section II.A of the FOA on p.28: The period of performance for funding agreements may not exceed 36 months.

QUESTIONS AND ANSWERS

Q15. If we propose to develop a sensor in Category C, can sensor testing at a subcontractor facility be included as a Task or would that work require a separate submission under Category D?

ANSWER: See ARPA-E's response to Q10 above.

Q16. Question for category A: Would any communication between the proposed technology in the residence and a central system disqualify it from this program (software updates, recalibration, and basically anything other than PII and the occupancy binary signal)?

ANSWER: No, as set forth at Section I.D of the FOA on p.10: Due to the market desire for a solution and the difficulty of obtaining this solution, some researchers have implemented a "data fusion" scheme, and combining information from multiple types of sensors is a growing effort. The greater availably of very low cost and low power distributed sensing networks, based on hardware incorporating communication and significant computation abilities, coupled with novel work in the algorithm space, could have great promise for this sensor fusion area. ARPA-E encourages work in this field and believes there is promise in the data fusion space, as long as any proposed work meets the metrics in this FOA.

Q17. The announcement, page 10, states that ARPA-E encourages data fusion based approaches. However, on page 43 it states "Each Concept Paper must be limited to a single concept or technology". Is it safe to assume that data fusion that integrates several technologies is viewed as a single integrative technology?

ANSWER: Yes.

Q18. Should the focus be on static (e.g., scent, heart rate) and not on dynamic (e.g., gait, vibration, sound) properties/traits?

ANSWER: See General FAQ 2.7, found at https://arpa-e.energy.gov/?q=faq/general-questions.

QUESTIONS AND ANSWERS

Q19. What are the required environmental parameters ranges (e.g., noise, vibrations, light levels) for testing?

ANSWER: Environmental thresholds are dependent upon the selected application scenario and not strictly defined within the FOA as these conditions vary across the U.S. building sector.

Q20. Should we consider active deception when designing and testing the system?

ANSWER: See General FAQ 2.7, found at https://arpa-e.energy.gov/?q=faq/general-questions, and ARPA-E's response to questions concerning applicability of DOE IRB protocols.

Q21. Is a Category A project required to have field tests? It seems like from Table 1 only lab-based hardware testing with simulated scenarios is required. Is this a correct interpretation of Table 1 about Category A projects?

ANSWER: As set forth in Section I.D of the FOA on pp. 8-9: Submissions addressing Categories A, B, and/or C must be included in one Concept Paper, and Submissions addressing Category D must be included in a separate Concept Paper. For example, this could include a residential solution that includes full, real-world field testing and validation development (Categories A and D – two distinct Concept Papers); a complete commercial solution with both people counting and CO2 sensors and development of a real-world field testing and validation protocol (Categories B, C, and D – two Concept Papers); a sensor system for people counting and CO2 detection (Categories B and C – one Concept Paper), or other combinations. Applicants submitting to Categories A, B, and C but not submitting to Category D must still perform controlled laboratory-based hardware testing (see Section I.E of the FOA), but they will not be required to submit their technologies for testing and validation by Category D teams. Teams submitting in Category D only will develop simulation tools and real-world field testing protocols for human presence or people counting technologies in general. Collaboration between Categories A, B, C and Category D teams are strongly encouraged but not required.

Q22. If a Category A project is not required to have field tests, what are the expectations for simulation software and lab setup to validate the findings?

ANSWER: As set forth in Section I.E of the FOA on p.14: For illustration regarding these failure metrics we provide an example of simple analyses with simplifying assumptions to establish a baseline for the level of detail required to be included in submissions in Section I.G of the FOA. We emphasize that more complex and accurate simulations with more "real-life" data using multiple deployment scenarios will be required as the program progresses. In general, submissions should incorporate milestones at the 6 month mark providing extensive baseline simulations of required performance and at the 2 year mark provide simulations that incorporate actual detector system measurements showing clear progress towards the final metrics of the program.

QUESTIONS AND ANSWERS

Q23. If a Category A project is required to have field tests, will this program facilitate collaborations between teams of Category A and Category D projects?

ANSWER: Yes, ARPA-E encourages this activity. As set forth in Section I.D of the FOA on pp. 8-9: Submissions addressing Categories A, B, and/or C must be included in one Concept Paper, and Submissions addressing Category D must be included in a separate Concept Paper. For example, this could include a residential solution that includes full, real-world field testing and validation development (Categories A and D – two distinct Concept Papers); a complete commercial solution with both people counting and CO2 sensors and development of a real-world field testing and validation protocol (Categories B, C, and D – two Concept Papers); a sensor system for people counting and CO2 detection (Categories B and C – one Concept Paper), or other combinations. Applicants submitting to Categories A, B, and C but not submitting to Category D must still perform controlled laboratory-based hardware testing (see Section I.E of the FOA), but they will not be required to submit their technologies for testing and validation by Category D teams. **Teams submitting in Category D only will develop simulation tools and real-world field testing protocols for human presence or people counting technologies in general. Collaboration between Categories A, B, C and Category D teams are strongly encouraged but not required. (emphasis added)**

Q24. The FOA does not clearly state the counting of pets. Are they counted as human or not as humans, or as pets? This statement in the FOA should be clarified, "These metrics must be met including households occupied by both humans and pets."

ANSWER: The text found in Section I.E of the FOA on p.14 is accurate and clear as written.

Q25. Will indirect methods (inference based) for accurately determining human presence inside a building be suitable? Or should the human presence be directly sensed?

ANSWER: See General FAQ 2.7, found at https://arpa-e.energy.gov/?q=faq/general-questions.